June 2001

Mathematics 33

Grade 12 Diploma Examination

Alberta
LEARNING

Mathematics 33

Grade 12 Diploma Examination

Description

Time: This examination was developed to be completed in 2.5 h; however, you may take an additional 0.5 h to complete the examination.

This is a **closed-book** examination consisting of

- 37 multiple-choice and 12 numerical-response questions, of equal value, worth 70% of the examination

- 4 written-response questions worth 30% of the examination

This examination contains sets of related questions.

A set of questions may contain multiple-choice and/or numerical-response and/or written-response questions.

A mathematics data booklet is provided for your reference.

Note: *The perforated pages at the back of this booklet may be torn out and used for your rough work.*
No marks *will be given for work done on the tear-out pages.*

Instructions

- You are expected to provide a scientific calculator or a graphing calculator approved by Alberta Learning.   **NEW**

- You are expected to have cleared your calculator of all information that is stored in the programmable or parametric memory.   **NEW**

- Use only an HB pencil for the machine-scored answer sheet.

- Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.

- Read each question carefully.

- If you wish to change an answer, erase **all** traces of your first answer.

- Do not fold the answer sheet.

- The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Learning.

- Now turn this page and read the detailed instructions for answering machine-scored and written-response questions.

Multiple Choice

- Decide which of the choices **best** completes the statement or answers the question.

- Locate that question number on the separate answer sheet provided and fill in the circle that corresponds to your choice.

Example

This examination is for the subject of

A. biology
B. physics
C. chemistry
D. mathematics

Answer Sheet

Ⓐ   Ⓑ   Ⓒ   ●

Numerical Response

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.

- If an answer is a value between 0 and 1 (e.g., 0.7), then be sure to record the 0 before the decimal place.

- **Enter the first digit of your answer in the left-hand box and leave any unused boxes blank.**

Examples

Calculation Questions and Solutions

The value of tan 35°, to the nearest tenth, is _____ .

(Record your answer in the numerical-response section on the answer sheet.)

Calculator value: 0.7002075
Value to be recorded: 0.7

Record 0.7 on the answer sheet ⟶ | 0 | . | 7 | |

The constant term in the quadratic function $y = 2x^2 + 7x + 32$ is _____.

(Record your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 32

Record 32 on the answer sheet ⟶

3 2 ▢ ▢

⊙ ⊙
⓪ ⓪ ⓪ ⓪
① ① ① ①
② ● ② ②
● ③ ③ ③
④ ④ ④ ④
⑤ ⑤ ⑤ ⑤
⑥ ⑥ ⑥ ⑥
⑦ ⑦ ⑦ ⑦
⑧ ⑧ ⑧ ⑧
⑨ ⑨ ⑨ ⑨

Correct-Order Question and Solution

Four angles given below are to be drawn on a coordinate plane in standard position.

1   750°
2   650°
3   460°
4   845°

When the principal angles corresponding to the above angles are arranged in order from **lowest** to **highest**, then the order is ___, ___, ___, and ___.

(Record **all four digits** of your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 1342

Record 1342 on the answer sheet ⟶

1 3 4 2

⊙ ⊙
⓪ ⓪ ⓪ ⓪
● ① ① ①
② ② ② ●
③ ● ③ ③
④ ④ ● ④
⑤ ⑤ ⑤ ⑤
⑥ ⑥ ⑥ ⑥
⑦ ⑦ ⑦ ⑦
⑧ ⑧ ⑧ ⑧
⑨ ⑨ ⑨ ⑨

Written Response

- Write your answers in the examination booklet as neatly as possible.

- For full marks, your answers must address **all** aspects of the question.

- Descriptions and/or explanations of concepts must be correct and include pertinent ideas, diagrams, calculations, and formulas.

- Your answers must be presented in a well-organized manner using complete sentences and correct units.

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FARMING

Farming requires a variety of mathematical skills such as reading and interpreting graphs, and applying formulas, quadratic functions, statistics, and trigonometry.

Use the following information to answer the first question.

It is important that the salt ion concentrations in the water used to irrigate farmland are not too high. The ratio, R, of sodium ions to other ions in the water can be determined using the formula

$$R = \frac{N}{\sqrt{C + M}} \, ,$$

where N is the concentration of sodium ions in moles/m^3, C is the concentration of calcium ions in moles/m^3, and M is the concentration of magnesium ions in moles/m^3.

1. If C is 14 moles/m^3 and M is 9 moles/m^3, then the denominator of the expression on the right side of the equation can be rationalized by multiplying the numerator and denominator by

   A. $\sqrt{23}$
   B. 23
   C. $\sqrt{126}$
   D. 126

A 21.64 m auger is used to move grain from a pile on the ground up into a grain bin, as shown below.
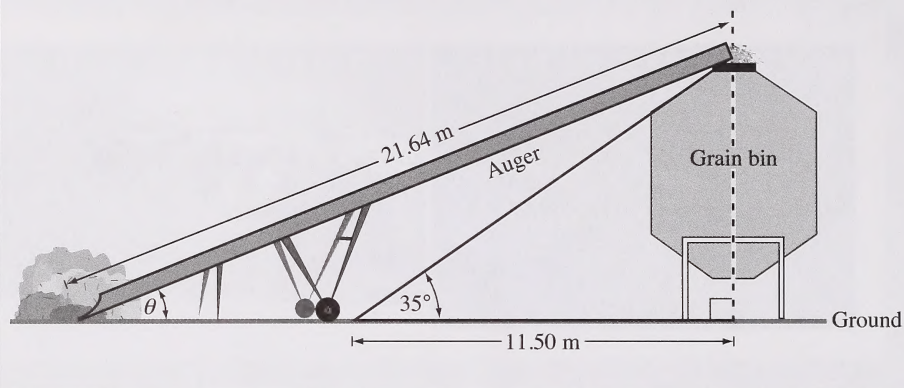
2. The angle of elevation, θ, of the auger is

A. 21.8°
B. 25.8°
C. 64.2°
D. 68.2°

> To determine if a canola field needs to be sprayed with herbicide, a farmer takes a random sample of 20 plants. This sample is made up entirely of canola and Canada thistle plants.

3. If this farmer were to increase the random sample to 80 plants, then the length of the 90% confidence interval would

   A.   be zero
   B.   increase
   C.   decrease
   D.   not change

_____

4. To purchase some land, a farmer needs to acquire funds from a bank. The type of agreement negotiated between the farmer and the bank is called

   A.   an annuity
   B.   a mortgage
   C.   a present value
   D.   a savings bond

Use the following information to answer the next question.

To test a new strain of canola, a farmer divided two fields, field A and field B, into sample plots of 1 m^2. He planted 400 seeds in each plot. Twelve weeks after planting the canola, he selected 40 plots from field A and 80 plots from field B, and then examined each plot. He wanted to answer the question, *"Have at least 300 seeds matured?"*

Results for Field A: Out of 40 plots, he had "**yes**" responses for 30 plots.
Results for Field B: Out of 80 plots, he had "**yes**" responses for 60 plots.

Written Response—5 marks

1. **a.** Based on a 90% confidence interval, the farmer can predict that between _____% and _____% of the plots in field A will contain at least 300 mature plants.

   b. Given that both field A and field B had a 75% success rate, why would the farmer be more confident in the results from the field with 80 plots than the results from the field with 40 plots?

c. • A third field, field C, has only a 10% success rate. If field C were divided into sample plots of 1 m² and the farmer selected 100 plots, then between _____ plots and _____ plots would have at least 300 mature plants.

• Suggest **at least** one explanation that could have caused the difference in results between field C and the other two fields.

Use the following additional information to answer the next part of the question.

The farmer decides to plant the new strain of canola in all of his fields. It will cost him $32 000 to purchase the required seed and farming chemicals. He will take out a $32 000 loan at 7.25% per annum for 1 year.

d. Determine the monthly payments on this loan.

A farmer has 20 windmill generators that produce an average of 300 W of electricity each. The farmer wants to increase the number of generators he has. For each generator that is added, 10 W are lost from each of the generators. To determine the number of generators that should be added to maximize total power production, the farmer uses a quadratic function and completes the square.

$$\text{Total power } (P) = (\text{number of generators})(\text{watts per generator})$$
$$x = \text{number of additional generators}$$

$$P = (20 + x)(300 - 10x)$$
$$P = -10x^2 + 100x + 6\,000$$
$$P = -10(x - 5)^2 + 6\,250$$

5. *To maximize total power production, the number of generators that the farmer should add is ____i____ and the total power produced will be___ii___ watts.*
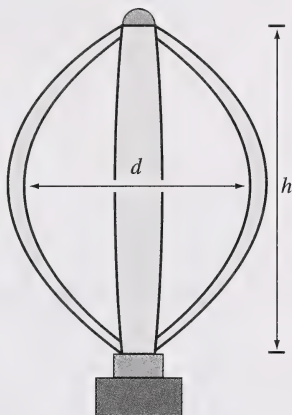
The statement above is completed by the numbers in row

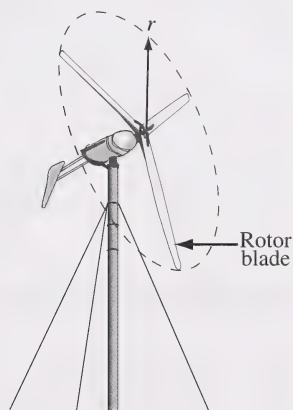|	*i*	*ii*
A.	5	6 250
B.	10	6 250
C.	6 250	5
D.	6 250	10

There are several models of windmills. A Darrieus rotor windmill and a conventional rotor windmill are shown below. The sweep area of a rotor blade is the total area covered in one rotation.

Darrieus Rotor Windmill

Conventional Rotor Windmill

Sweep area $= 11.07 \text{ m}^2$

Sweep area $= \pi r^2$

6. A conventional rotor windmill with the same sweep area as the Darrieus rotor windmill shown above would have a radius of

A. 1.06 m

B. 1.88 m

C. 3.52 m

D. 11.07 m

Solar panels can be used to produce electricity. Four solar panels are to be placed side by side, as shown below. The total area of the four panels is 48 m^2.


7. An equation that could be used to solve for the width, w, of **one** solar panel is

A. $10w + 2 - 48 = 0$
B. $w^2 + w - 48 = 0$
C. $w^2 + w - 12 = 0$
D. $16w^2 + 16w - 48 = 0$

The end view of the roof of a farmer's livestock shelter is in the shape of a parabola, as represented on the graph below. The roof can be represented by the quadratic function

$$h(x) = -0.125(x - 7)^2 + 6,$$

where $h(x)$ is the height of the roof, in metres, and x is the horizontal distance, in metres, from the origin of the graph.
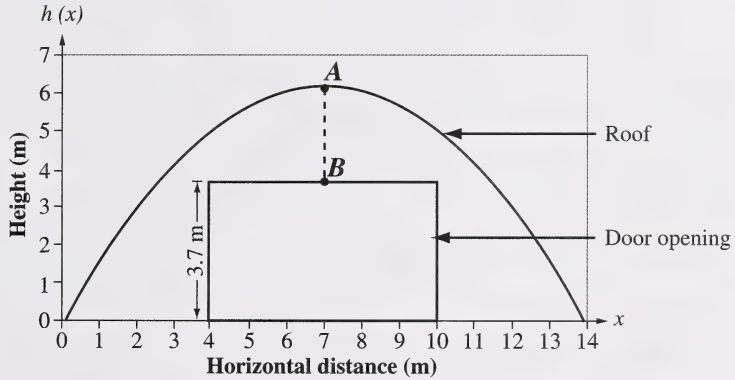
8. The distance, $\overline{AB}$, from the top of the door opening to the highest point on the roof, is

A. 0.6 m
B. 2.3 m
C. 3.0 m
D. 3.7 m

The average body temperature of some newborn calves that received their first feeding within an hour after birth is shown in the graph below.
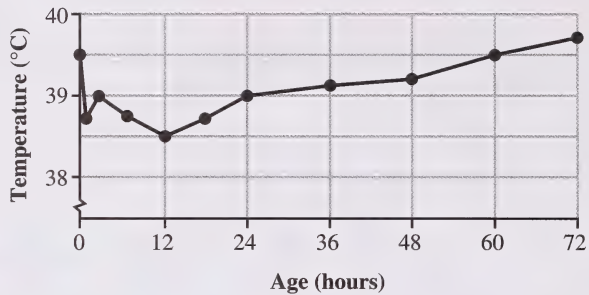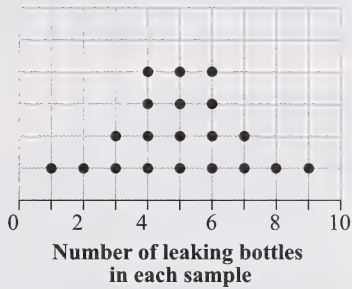

9. The range of the data on this graph is

A.   39.5°C to 39.7°C

B.   38.5°C to 39.7°C

**C.**   38.5°C to 39.4°C

D.   38.0°C to 40.0°C

At a processing plant, canola oil is bottled for use as cooking oil. A technician randomly selected 20 samples of 20 bottles each and tested them for leaks. The graph below shows the number of bottles that leaked in each sample.

**Number of leaking bottles
in each sample**

10. If a 90% box plot were drawn on the above grid, the box would include values from

A. 1 to 8 inclusive
B. 1 to 9 inclusive
**C.** 2 to 8 inclusive
D. 2 to 9 inclusive

MANUFACTURING

Engineers at a manufacturing company use computers to design heavy equipment. Skills in graphing, functions, trigonometry, and problem solving are required for the following set of questions.
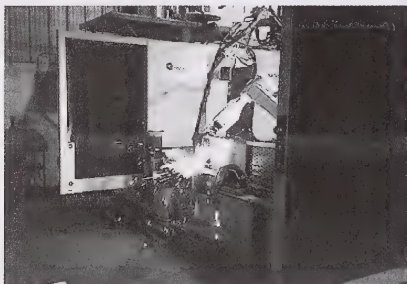
Use the following information to answer the next question.

The manufacturing company uses robots to weld three pieces of metal together, as shown in the diagram below. The robot places solder at points **P**, **Q**, and **R**.
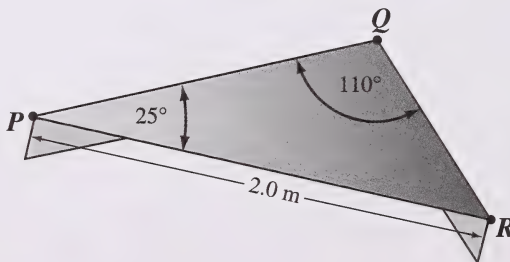
The robot then welds along the sides of the metal.

Numerical Response

1. The length of the weld along side $\overline{PQ}$, to the nearest tenth of a metre, is _____ m.

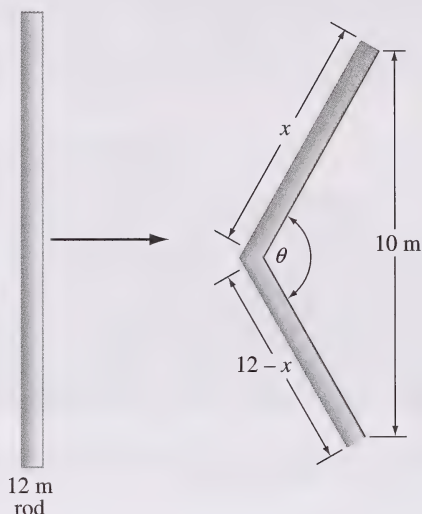(Record your answer in the numerical-response section on the answer sheet.)

12

The manufacturer makes ball hitches for heavy equipment. The formula below shows the relationship between the radius, r, of the ball part of the hitch and the volume, V, of the metal used to make the ball.

$$r = \sqrt[3]{\frac{3V}{4\pi}}$$

11. If a particular ball has a volume of 524 cm^3, then the radius of the ball is

    A.   5.0 cm

    B.   10.0 cm

    C.   10.7 cm

    D.   21.5 cm

At the manufacturing plant, a 12 m rod must be bent so that the two ends are 10 m apart.

12 m
rod

A machinist uses the following formula to determine θ.

$$\cos \theta = \frac{x^2 + (12 - x)^2 - 10^2}{2x(12 - x)}$$

Numerical Response

2. In this formula, the largest non-permissible value of x is _____ .

(Record your answer in the numerical-response section on the answer sheet.)

Numerical Response

3. The machinist must bend a second 12 m rod so that one side, x, must be 5.0 m long. For this rod, the solution for θ, correct to the nearest degree, is _____ °.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer the next question.

The machinist bent a third metal rod as shown below.
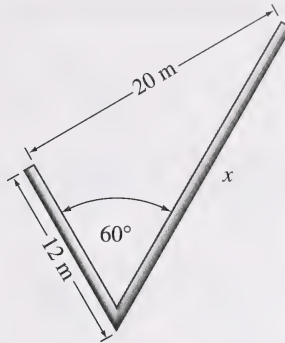
The following steps can be used to determine the position at which the machinist bent the rod.

Step 1 $\quad \cos 60° = \dfrac{12^2 + x^2 - 20^2}{2(12)x}$

Step 2 $\quad 24x\cos 60° = 12^2 + x^2 - 20^2$

Step 3 $\quad 12x = x^2 + 144 - 400$

Step 4 $\quad 0 = x^2 - 12x - 256$

Step 5 $\quad x = \dfrac{-(-12) \pm \sqrt{(-12)^2 - 4(1)(-256)}}{2(1)}$

Step 6 $\quad x = \dfrac{12 \pm 4\sqrt{73}}{2}$

Step 7 $\quad x \approx 23.1$

Numerical Response

4. Match two of the steps numbered above with their corresponding application below.

_____ The step where the quadratic formula was first applied   (Record in the **first** column.)

_____ The step where the cosine law was first applied   (Record in the **second** column.)

(Record **both digits** of your answer in the numerical-response section on the answer sheet.)

To calculate the length, L, of a gauge needle for a convex gauge, an employee at the manufacturing company uses the formula

$$R = \frac{(L-3)^2}{8(H-3)} + \frac{H}{2},$$

where R represents the radius of a convex gauge and H represents the maximum height of the arc made by the needle.

12. If R is 15 cm and H is 10 cm, then L is

A. 20.7 cm

B. 26.7 cm

C. 30.5 cm

D. 36.5 cm

_____

Managers of the manufacturing plant need to produce enough stock to maintain an inventory. The following formula is used to help them decide whether to increase or decrease production.

$$\text{Optimum production quotient} = \frac{\text{Cost of Goods Sold}(G)}{\text{Cost of Inventory}(I)}$$

Numerical Response

5. If the company's quarterly inventory costs are $18.25 million and the company is operating at an optimum production quotient of 4, then the cost of the goods sold, to the nearest million dollars, is $_____ million.

(Record your answer in the numerical-response section on the answer sheet.)

An engineer is designing a front-end loader. The lifting force, F, is related to the hydraulic fluid pressure, P, by the equation

$$P = \frac{F}{\pi(B^2 - R^2)},$$

where B is the radius of the hydraulic tube and R is the radius of the piston that pushes the hydraulic fluid inside the hydraulic tube.

13. To find the non-permissible values of this equation, the engineer first factors the denominator. The factored formula is
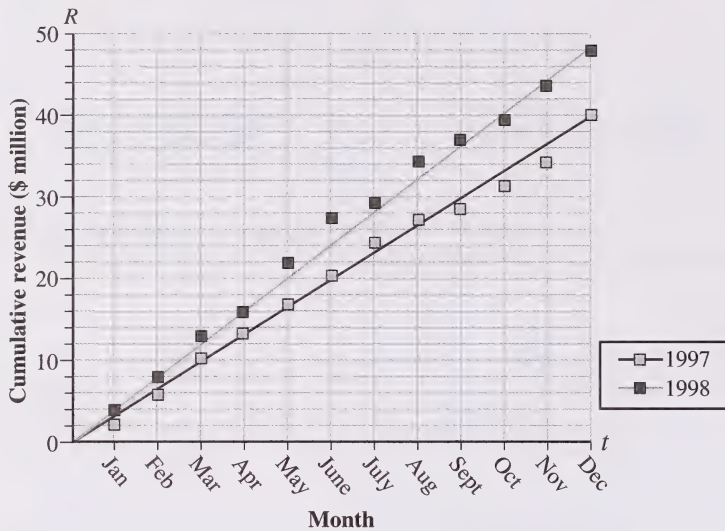
A. $P = \dfrac{F}{\pi(B - R)^2}$

B. $P = \dfrac{F}{\pi(B - R)(B - R)}$

C. $P = \dfrac{F}{\pi(B + R)(B + R)}$

D. $P = \dfrac{F}{\pi(B - R)(B + R)}$

An employee of the manufacturing company produced a **cumulative** revenue graph for 1997 and 1998.

The employee made the following statements about the information in the graph.

I   Both graphs have a positive correlation.

II   The revenues for 1998 are higher than the revenues for 1997.

III   Since the slope of the 1998 graph is greater than the slope of the 1997 graph, the correlation of the 1998 graph is stronger.

14. According to the information in the graph, the correct statements are

A.   I and II only

B.   I and III only

C.   II and III only

D.   I, II, and III

18

A machinist who works 40 h/week checks his machine for excess metal chips once every hour. In one particular week, he found excess metal chips 28 times.

15. *Based on his findings for this week, the machinist can be 90% confident that between___i___% and _____ii___% of the time he will find excess metal chips in his machine.*

The statement above is completed by the numbers in row

	i	*ii*
A.	50	85
B.	58	83
C.	60	75
D.	60	80

SPORTS AND RECREATION

In a large city, a multipurpose stadium with an attached fitness centre is going to be built. The next set of questions relates to the planning and design of the facility, as well as to some of the recreational events that will be housed within it.

On behalf of the city council, Joanne conducted a survey. Of the people surveyed, 40% responded "**yes**" to the question "Would you use a fitness centre if it were built in the stadium?"

16. Given the results of this survey, the 90% confidence interval for the number of people who would respond "yes" to this survey question from a random sample of 100 is between

A. 28 and 48

B. 28 and 53

C. 32 and 48

D. 32 and 53

The city council needs to finance $125 000 to cover part of the cost of building the facility. The council compared the cost of mortgaging this amount at a rate of 6.5% over 15 years with the cost of mortgaging this amount at the same rate over 20 years.

17. The difference in the monthly payments between a 15-year mortgage and a 20-year mortgage, to the nearest cent, is

A. $88.35

B. $89.42

C. $157.34

D. $158.49

A designer wishes to sketch various parabolic shapes that could be used in the design of the fitness centre. If the location of the vertex and the x-intercepts of a parabola, which are represented by the function $y = 2x^2 + 16x + 30$, are known, then the designer can sketch the shape.

To determine the vertex, the designer writes the function in the form $y = a(x - h)^2 + k$ by completing the square, as shown below.

Step 1	$y = 2x^2 + 16x + 30$
Step 2	$y = 2(x^2 + 8x + 16 - 16) + 30$
Step 3	$y = 2(x^2 + 8x + 16) + 30 - 32$
Step 4	$y = 2(x + \underline{\quad\quad})^2 - \underline{\quad\quad}$
Step 5	Vertex is ($\underline{\quad\quad}$, $\underline{\quad\quad}$)

Written Response—5 marks

2. **a.** Complete steps 4 and 5.

Step 4 $\quad y = 2(x + \underline{\quad\quad})^2 - \underline{\quad\quad}$

Step 5 $\quad$ Vertex is ($\underline{\quad\quad}$, $\underline{\quad\quad}$)

b. The x-intercepts of the function can be found when the function is written as the quadratic equation $2x^2 + 16x + 30 = 0$. Algebraically determine the x-intercepts of this equation.

c. • Plot the vertex and *x*-intercepts of the quadratic function, and then sketch the parabola on the grid below.

• Label the vertex and *x*-intercepts of the quadratic function on your graph.
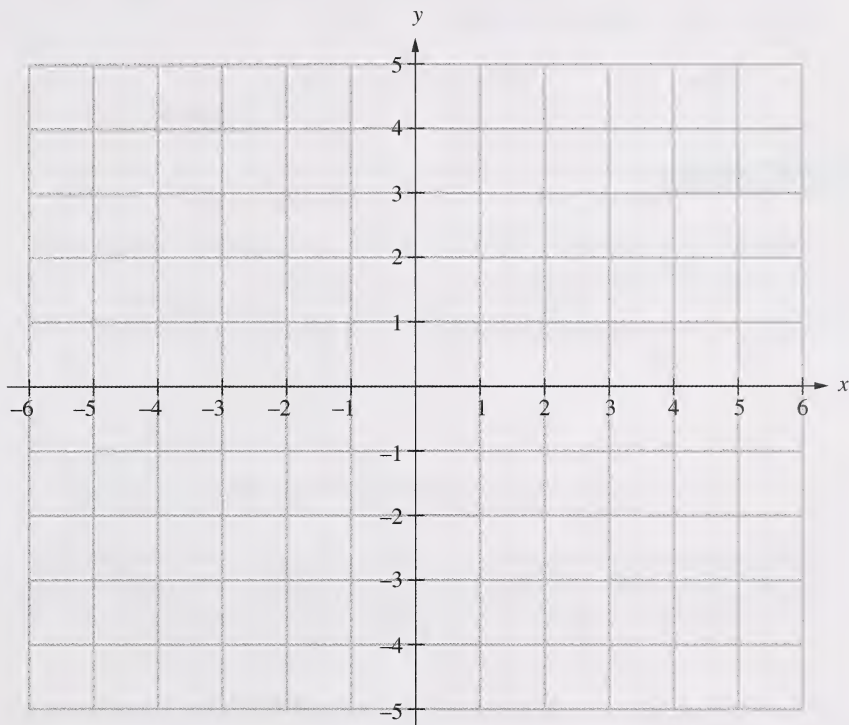
Each year, the fitness centre will pay $20 000 in operating costs. The fitness centre will charge a $250 annual membership fee per member. The formula used to determine the fitness centre's annual profit, P, in dollars, as a function of the number of members, n, is

$$P(n) = \$250n - \$20\,000.$$

Numerical Response

6. To make an annual profit of $30 000, the fitness centre will have to have _____ members.

(Record your answer in the numerical-response section on the answer sheet.)

_____

The manager of the fitness centre plans to purchase a $60 000 piece of cross-training equipment. She will make a down payment of $10 000 and take out a loan to finance the balance over 5 years at 6.75% per annum.

18. The monthly payment on the financed balance, correct to the nearest cent, will be

    A. $981.99

    B. $984.18

    C. $1 178.39

    D. $1 181.01

A trainer at the fitness centre uses a ratio called the Body-Mass Index, I, to determine if people are overweight. The ratio is given by the equation

$$I = \frac{m}{h^2},$$

where m is mass in kilograms, and h is height in metres.

According to this index, a particular male is classified as overweight if his Body-Mass Index is **greater** than 25.6.

19. Before being classified as overweight, the maximum mass that this 1.75 m tall male can reach is

A. 8.4 kg

B. 33.3 kg

C. 44.8 kg

D. 78.4 kg

20. The equation above can also be written as

A. $h = \sqrt{\dfrac{m}{I}}$

B. $h = \sqrt{\dfrac{I}{m}}$

C. $h = \dfrac{m}{I^2}$

D. $h = I^2 m$

A computerized piece of fitness equipment costs $7 200.00. The manager of the fitness centre made a down payment of 15%, with the balance being covered by a loan at 12% per annum, amortized over 3 years.

Written Response—6 marks

3. **a.** The amount of the down payment was (0.15)($7 200) = $_____.

b. • The amount of the loan was $7 200 – $_____ = $_____.

• Determine the monthly payment on the loan. Show all calculations.

• Find the total cost for the equipment. Include the down payment and all the payments made until the loan is paid out.

c. State the difference between the list price of $7 200.00 and the total amount paid. Explain the reason for this difference.

The training load of an athlete training at the fitness centre can be described in terms of the intensity of the workout, measured on a scale of 0 to 9. As an athlete prepares throughout the year for competition, the intensity of his or her workout varies as a function of the time of year. The graph below illustrates the intensity of a particular athlete's workout for one year.
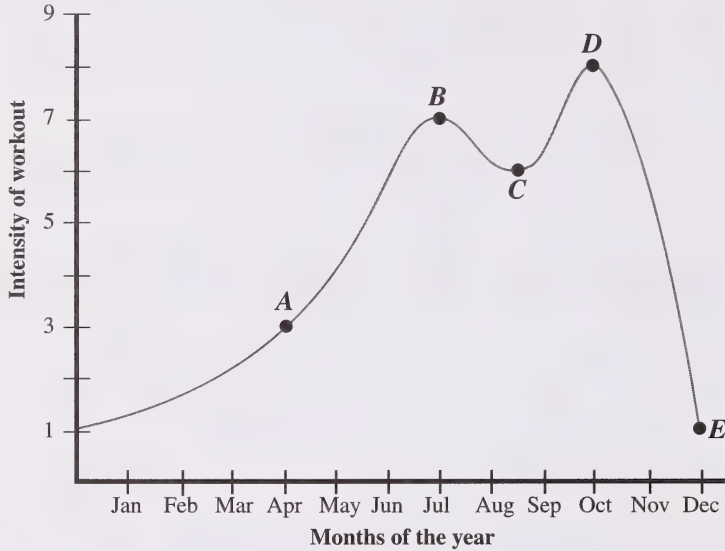
21. *The point on the graph that represents the maximum intensity of the athlete's workouts is point _____i_____, and the athlete changed the intensity of the workouts most between points _____ii_____.*

The statement above is completed by the letters in row

	i	*ii*
A.	*A*	*A* and *B*
B.	*B*	*D* and *E*
C.	*D*	*A* and *B*
D.	*D*	*D* and *E*

The sound from sports events in the stadium is transmitted by sound waves that can be represented as shown in the diagram below.
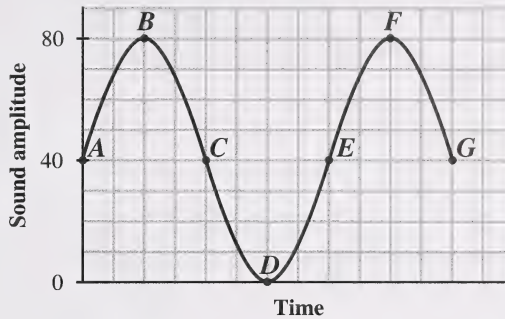
Sound waves take the graphical form of a sine wave.

22. The period of the sound wave in the diagram above can be represented by the distance from

A. *A* to *C*
B. *A* to *D*
C. *A* to *E*
D. *A* to *F*

The gymnasium in the stadium will be rectangular and have an area of $1\,925\ \text{m}^2$. The gymnasium will be $20\ \text{m}$ longer than it is wide.

$x + 20$

x
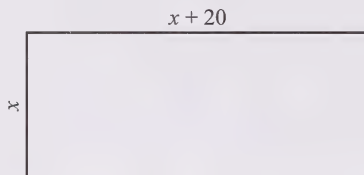
23. The quadratic equation that can be used to find the dimensions of the gymnasium is

    A. $x^2 + 20 = 1\,925$

    B. $2x^2 + 40x = 1\,925$

    C. $x^2 + 20x + 1\,925 = 0$

    D. $x^2 + 20x - 1\,925 = 0$

In basketball, a player executing a bounce pass needs to know how the ball should be directed toward the floor so that it will bounce up into the hands of the intended receiver.

Player **1**

Player **2**

4.0 m

1.5 m

$\theta°$

3.2 m

Floor
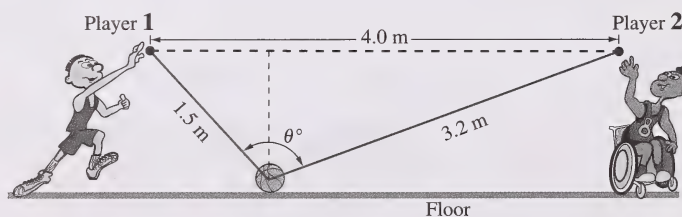
24. In the diagram above, the measure of angle θ, to the nearest degree, is

    A. $37°$

    B. $48°$

    C. $111°$

    D. $118°$

Use the following information to answer the next question.

A basketball player experiments by throwing a ball at various angles to the horizontal to see how the angle affects the horizontal distance that the ball travels. The graphs below represent the paths of four balls thrown by the player. The general quadratic function $y = a(x - h)^2 + k$ describes each of the graphs below. The graphs are drawn to the same scale.
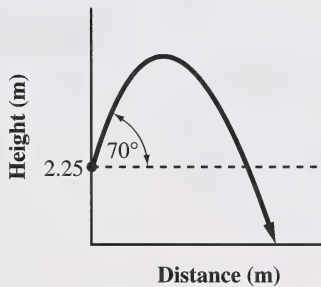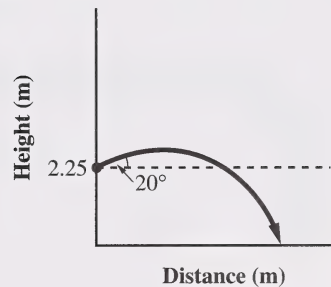
1
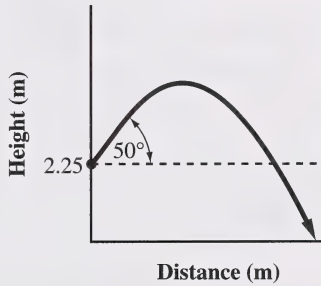
2
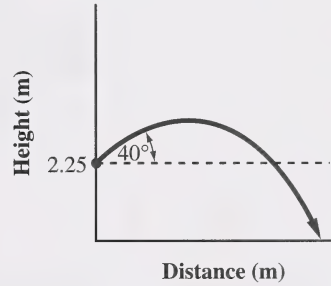
3

4

Numerical Response

7. For each graph above, the quadratic function has a different value of k. When these four values of k are ordered from **lowest** value to **highest** value, then their order is _____, _____, _____, and _____.

(Record **all four digits** of your answer in the numerical-response section on the answer sheet.)

31

The effect of temperature on the bounce of two types of balls was tested at the stadium. The balls were at different temperatures and were dropped from a height of 2.0 m. The results were charted below.

|	Height of Bounce from 2.0 m		
Type of Ball	Ball cooled in freezer 1 hr	Ball at room temperature	Ball heated 15 min at 225°C
Baseball	0.46 m	0.51 m	0.55 m
Golf ball	0.82 m	1.17 m	1.29 m

25. *Compared with the results for a ball at room temperature, an increase in the temperature of a ball will _____ i _____ the bounce height, and a decrease in the temperature of a ball will _____ ii _____ the bounce height.*

The statement above is completed by the words in row

	i	*ii*
A.	increase	decrease
B.	increase	increase
C.	decrease	increase
D.	decrease	decrease

A gymnast performing on a horizontal bar rotates from a horizontal position to a position of −130°.
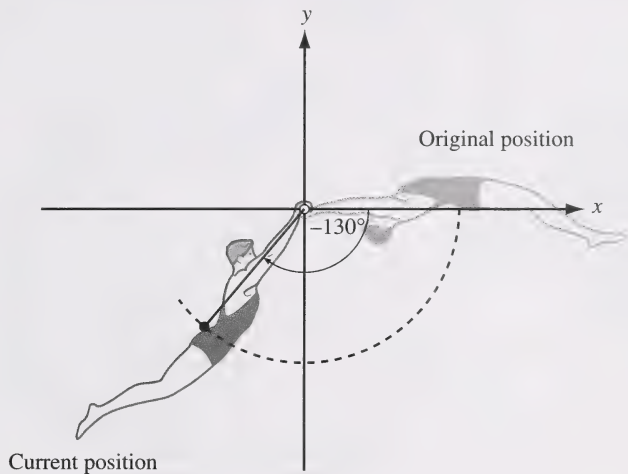
Numerical Response

8. The principal angle of the gymnast's current position is _____°.

(Record your answer in the numerical-response section on the answer sheet.)

The force exerted by an arm wrestler depends on the angle of the wrestler's forearm relative to the table top. The force, in newtons, that a particular wrestler exerts when his forearm is at different angles is shown below.
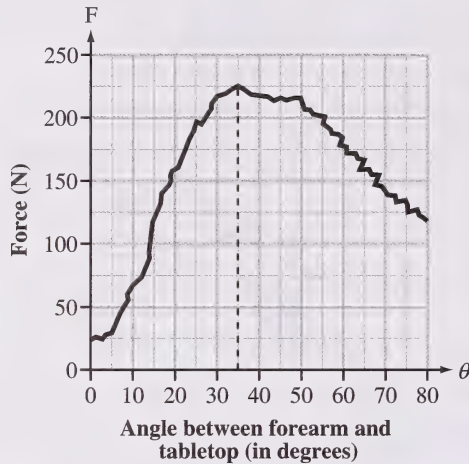
Written Response—5 marks

4. a. • The arm wrestler obtains maximum force when his elbow is at
   _____°.

   • What is the range, in N, of this graph?

Wrestler **1**   Wrestler **2**

30.2 cm

26.9 cm

h

35°   40°

w
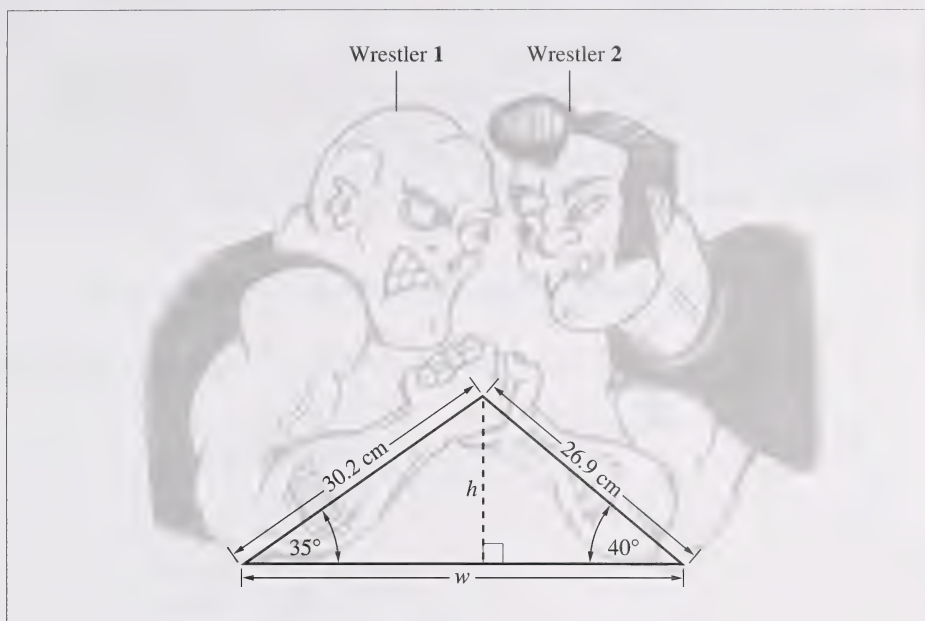
b.   Wrestler 1 has a forearm length of 30.2 cm, and he raises his forearm at an angle of 35° from the table. Wrestler 2 has a forearm length of 26.9 cm, and he raises his forearm at an angle of 40° from the table.

• Determine the height, h, that their hands are above the table. Express your answer to the nearest tenth of a centimetre.

• What is the minimum width, w, that the table will need to be for this match? Express your answer to the nearest tenth of a centimetre.

CONNECTIONS

For the next set of questions, you can transfer the skills and procedures learned in simplifying fractions and polynomial expressions to working with rational and radical expressions. You can also apply your knowledge of annuities, mortgages, and loans.

Use the following information to answer the next question.

The cost, in Canadian dollars (Cdn), of buying American dollars (US) is given in the graph below.

**Cost of $1 US in Canadian Dollars
for One Fiscal Year**
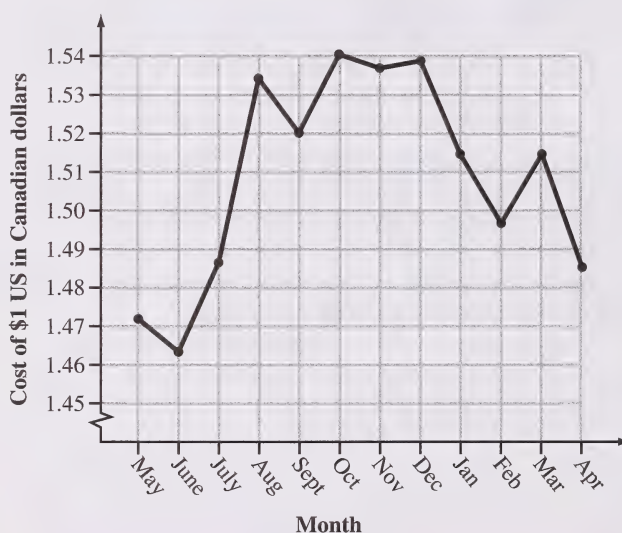
Numerical Response

9. In September, the cost, in Canadian dollars, to purchase $1.6 million US, to the nearest tenth of a million, was $_____ million Cdn.

(Record your answer in the numerical-response section on the answer sheet.)

The projected number of hip fractures per year in a Western country is graphed below. For this graph, the equation of the line of best fit is determined using the formula

Number of fractures per year (in hundreds of thousands) = **0.07 (number of years after 1980) + 1.2**

Projected Number of Hip Fractures
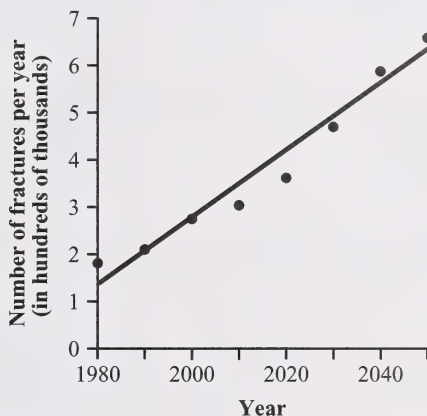
Numerical Response

10. Correct to the nearest tenth, the projected number of hip fractures in the year 2060, in hundreds of thousands, is _____.

(Record your answer in the numerical-response section on the answer sheet.)

37

A particular savings account with a starting balance of $80 000 pays interest at 9% per annum, compounded monthly, on the balance.

From this account, a person receives payments of $3 000 per month, at the end of every month.

A section of a spreadsheet for this account is shown below.

	A	B	C	D	E
	Payment date	**Starting balance**	**Interest earned**	**Payment received**	
1					**Balance**
2	October 31	$80 000.00	$600.00	$3 000.00	$77 600.00
3	November 30	$77 600.00	$582.00	$3 000.00	$75 182.00
4	December 31	$75 182.00	$563.87	$3 000.00	

In a spreadsheet, information is located in "cells" designated by a letter and a number. For example, the date October 31 has a cell address of **A2**.

26. An equation that would determine the balance on December 31 in cell **E4** is

A. E4 = B4 + C4 – D4

B. E4 = B4 – C4 + D4

C. E4 = B4 * (0.09 ÷ 12) – D4

D. E4 = B4 * (0.09 ÷ 12) + D4

A particular person has made the following financial transactions.

1   A monthly payment to pay off the house

2   A monthly payment on a car debt

3   A monthly investment into an RRSP for the next 20 years

4   A monthly withdrawal from an investment made 3 years ago

Numerical Response

11.   Match each of the person's financial transactions, as numbered above, with its respective plan, as given below.

Amount of annuity _____ (Record in the **first** column.)

Loan _____ (Record in the **second** column.)

Mortgage _____ (Record in the **third** column.)

Present value of annuity _____ (Record in the **fourth** column.)

(Record **all four digits** of your answer in the numerical-response section on the answer sheet.)

To solve the rational equation $\dfrac{3}{x-1} - \dfrac{5}{x} = 1$, where $x \neq 0$ or 1, a student wrote the following steps.

Step I $\quad$ *Lowest Common Denominator* $= (x-1)(x)$

Step II $\quad (x-1)(x)\left[\dfrac{3}{x-1} - \dfrac{5}{x}\right] = [1](x-1)(x)$

Step III $\qquad\quad 3(x) - 5(x-1) = (x-1)(x)$

Step IV $\qquad\quad\ \ 3x - 5x - 5 = x^2 - x$

Step V $\qquad\qquad\qquad\quad\ 0 = x^2 + x + 5$

27. The student made an error in

  A. step I
  B. step II
  C. step III
  D. step IV

_____

28. A simplified form of $\dfrac{x^2 - x - 2}{x^2 + 7x + 12} \div \dfrac{x^2 - 3x + 2}{x^2 - 9}$,
    where $x \neq -4,\ -3,\ 1,\ 2,\ $ or 3, is

  A. $\dfrac{(x+2)(x-3)}{(x+4)(x-2)}$

  B. $\dfrac{(x+4)(x-1)}{(x+1)(x-3)}$

  C. $\dfrac{(x+1)(x-3)}{(x+4)(x-1)}$

  D. $\dfrac{(x-2)(x+1)}{(x+4)(x-1)}$

A student was asked to solve the equation $\sqrt{2n+7} - 1 = n$. The following steps were performed by the student.

$$\text{Step I} \qquad 2n + 7 + 1 = n^2$$

$$\text{Step II} \qquad 2n + 8 = n^2$$

$$\text{Step III} \qquad 0 = n^2 - 2n - 8$$

$$\text{Step IV} \qquad 0 = (n - 4)(n + 2)$$

29. The student's first error occurred in

A. step I
B. step II
C. step III
D. step IV

30. In the equation $0 = 1.6x^2 + 16.6x - 427.3$, the solutions for x are

A. $x = \dfrac{16.6 \pm \sqrt{2\,459.16}}{3.2}$

B. $x = \dfrac{-16.6 \pm \sqrt{2\,459.16}}{3.2}$

C. $x = \dfrac{16.6 \pm \sqrt{3\,010.28}}{3.2}$

D. $x = \dfrac{-16.6 \pm \sqrt{3\,010.28}}{3.2}$

31. In triangle *ABC*, the distance $\overline{AB}$, to the nearest tenth of a metre, is

   A. 27.7 m
   B. 32.0 m
   C. 35.8 m
   D. 39.7 m

Use the following triangle to answer the next question.
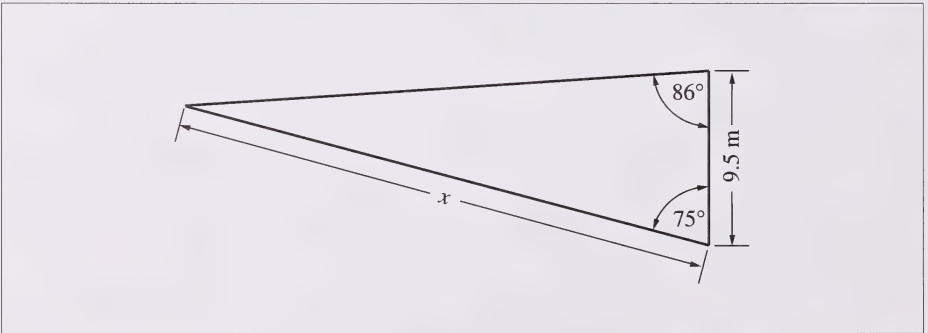
32. In the triangle above, what is the length of side *x*, to the nearest tenth of a metre?

   A. 28.2 m
   B. 29.1 m
   C. 32.4 m
   D. 36.7 m

The following diagram shows a coordinate plane with the quadrants labelled.
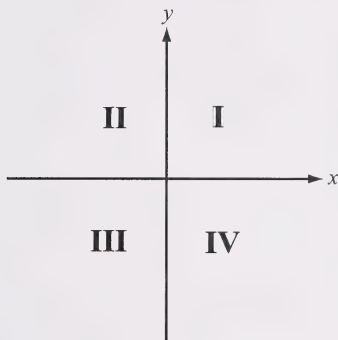
33. If $\sin\theta = -0.5736$ and $\tan\theta = 0.7002$, where $0° \leq \theta < 360°$, then θ is an angle that terminates in quadrant

    A.   I

    B.   II

    C.   III

    D.   IV

34. If $\tan\theta = -\dfrac{4}{3}$ and angle θ terminates in quadrant four, then $\cos\theta$ equals

    A. $\dfrac{3}{5}$

    B. $\dfrac{4}{5}$

    C. $-\dfrac{3}{5}$

    D. $-\dfrac{4}{5}$

35. Which of the following formulas is a quadratic function?

   A. $h = 15.9p$

   B. $h = \dfrac{v^2}{19.6}$

   C. $h = 4.1\sqrt[3]{Q^2}$

   D. $h = \dfrac{P}{74}$

Use the following information to answer the next question.

Four points on a parabola are identified, as shown below.
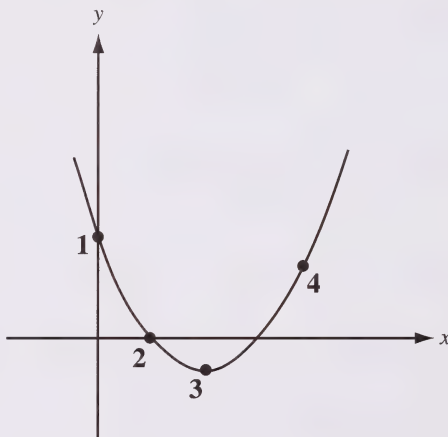
Numerical Response

12. Match three of the points numbered above with their corresponding description below.

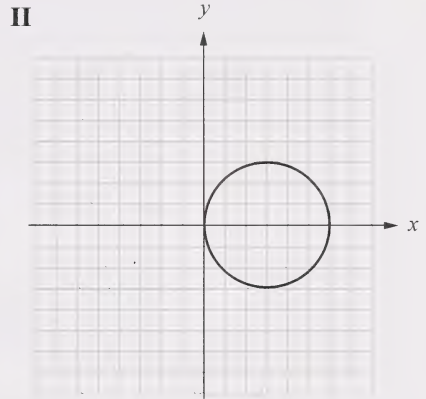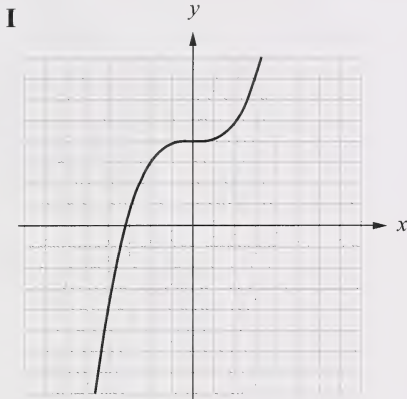 x-intercept   _____   (Record in the **first** column.)

   y-intercept   _____   (Record in the **second** column.)

   Vertex   _____   (Record in the **third** column.)

   (Record **all three digits** of your answer in the numerical-response section on the answer sheet.)

Four Graphs

I

II

III

IV
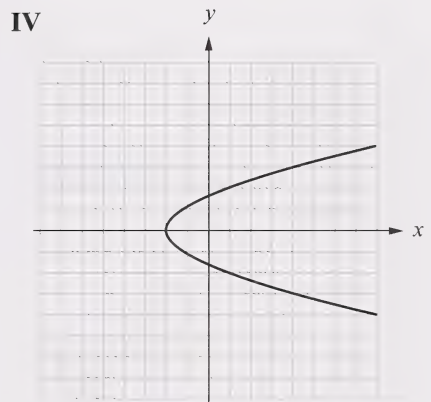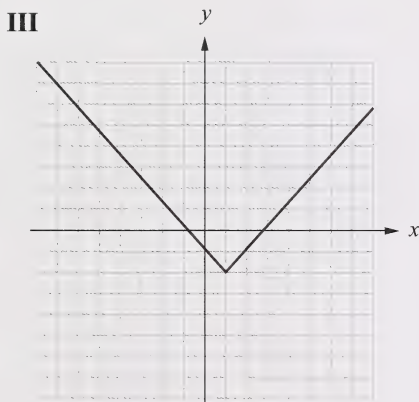
36. The graphs above that represent functions are graphs

A. I and III
B. I and IV
C. II and IV
D. I, II, and III

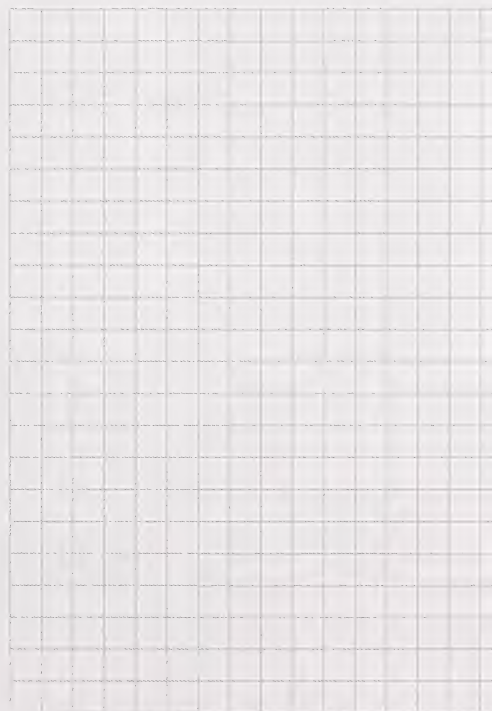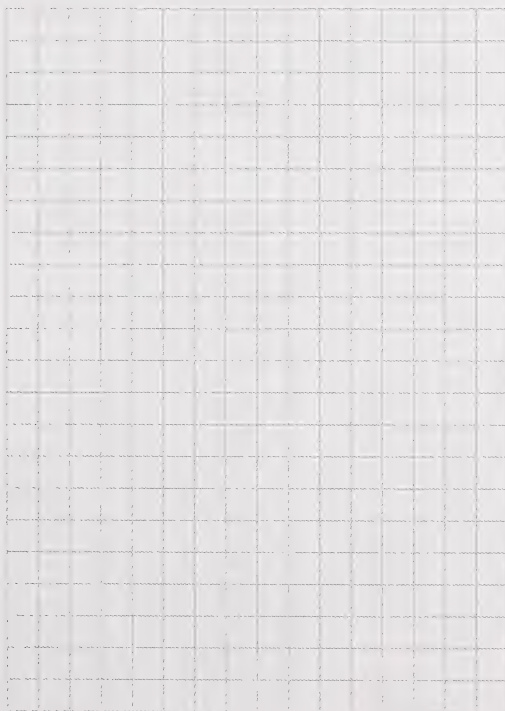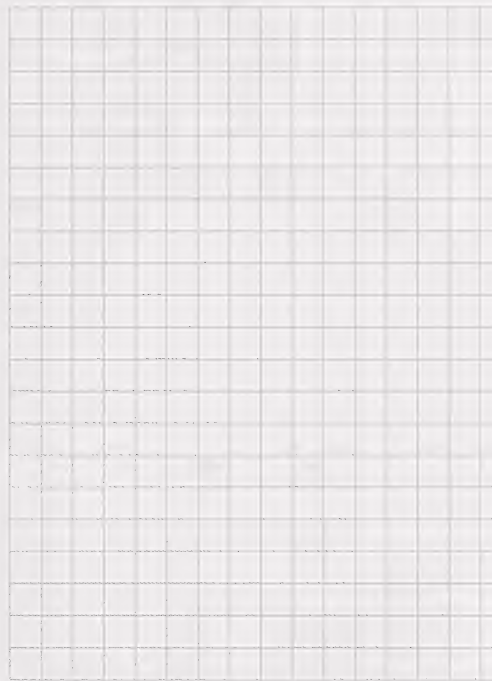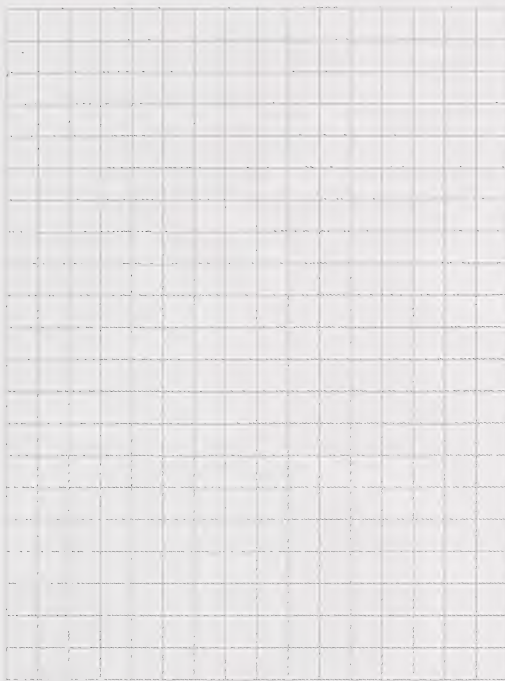The graph of a reciprocal function is shown below.
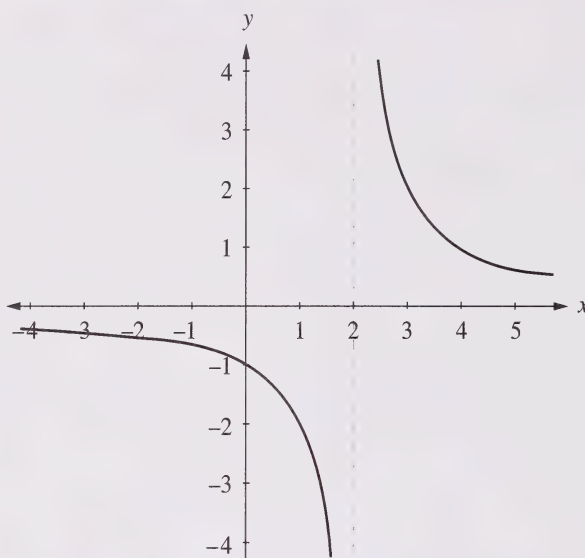
37. A non-permissible value of the reciprocal function represented by the graph is

A. $y = -1$
B. $x = -2$
C. $x = 0$
D. $x = 2$

You have now completed the examination
If you have time, you may wish to check your answers.

Mathematics 33

June 2001

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